

The Magic School Bus

LOST IN THE SOLAR SYSTEM



By Joanna Cole

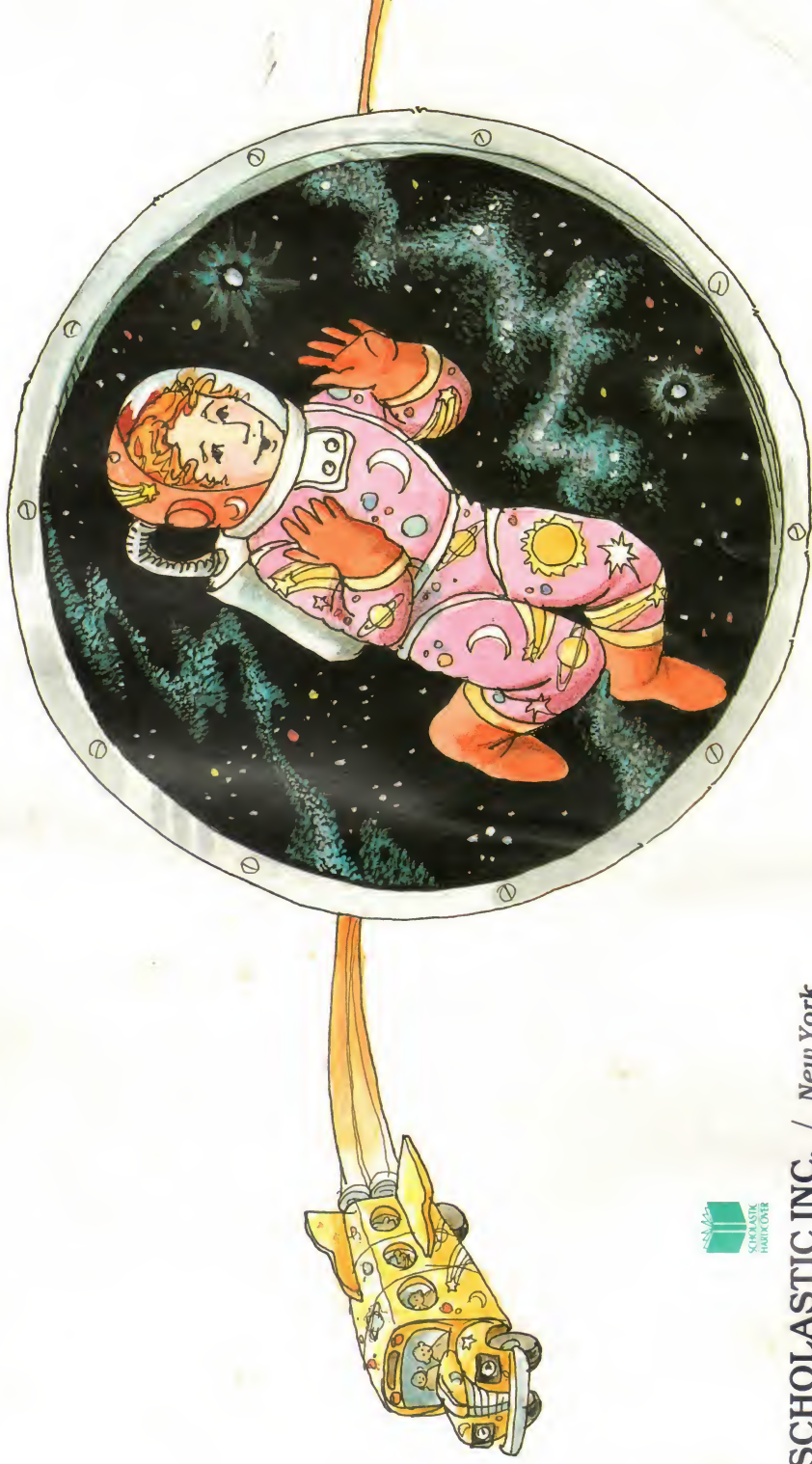
Illustrated by

Bruce Degen

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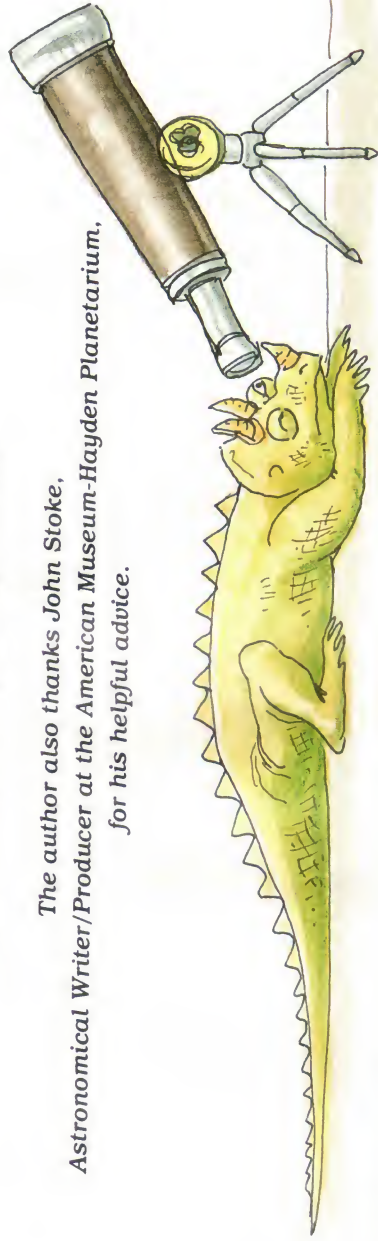
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Summary: On a special field trip in the magic school bus,
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in the solar system.

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To Virginia and Bob McBride—J.C.

For Chris, queen of the
Biscadorian Mother ship—B.D.



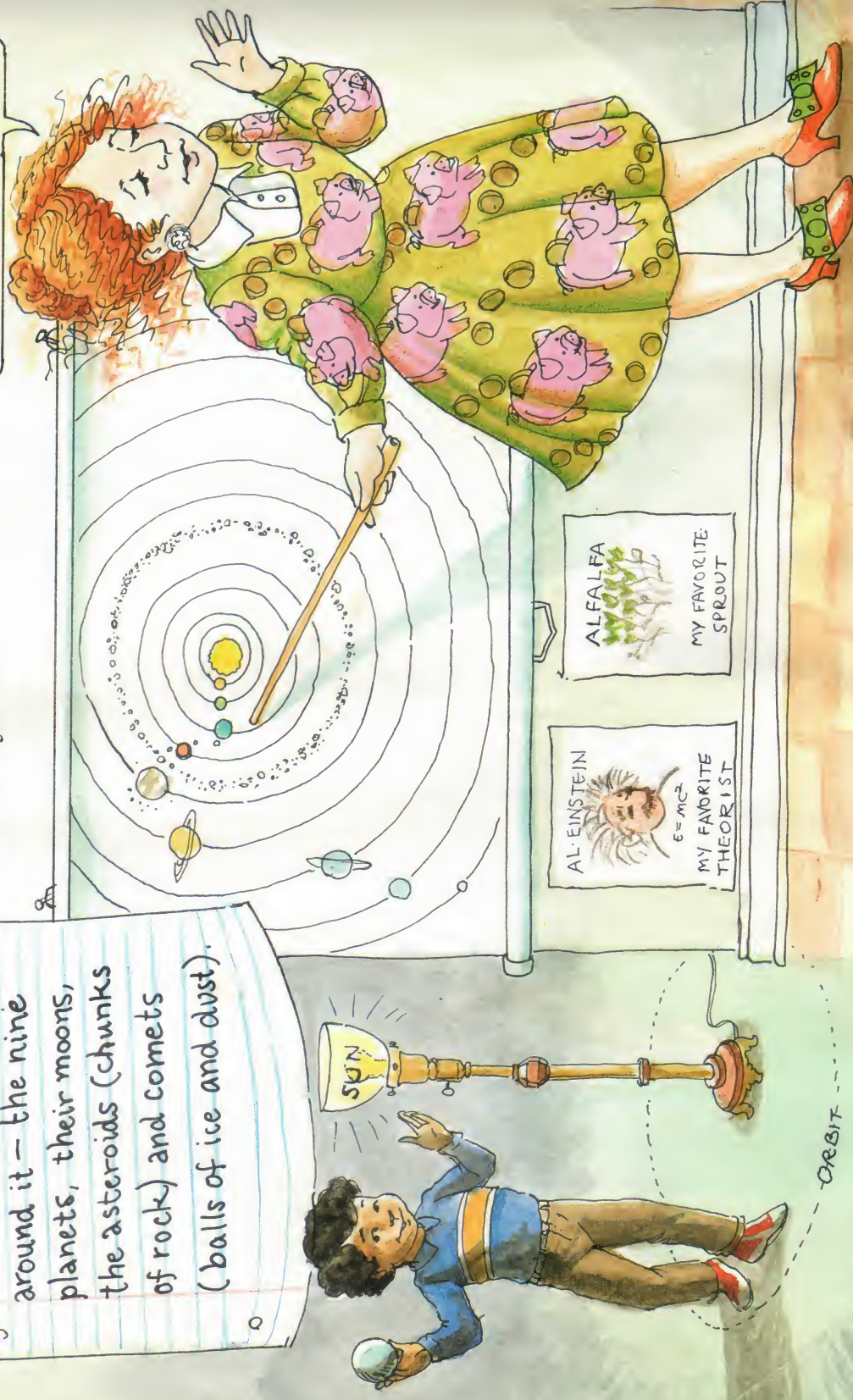
WHAT IS THE SOLAR SYSTEM?

by John

The solar system is the Sun and all the bodies that orbit around it — the nine planets, their moons, the asteroids (chunks of rock) and comets (balls of ice and dust).

It was trip day again in Ms. Frizzle's class. Everyone was excited. We were going to the planetarium to see a sky show about the solar system.

CLASS, AN ORBIT IS THE PATH OF A PLANET OR OTHER OBJECT AROUND THE SUN.



Arnold's cousin Janet was
visiting our class for the day.
"I know all of you
will be nice to our guest," said the Friz.

I KNEW THAT.
I GET ALL A'S
IN SCHOOL.

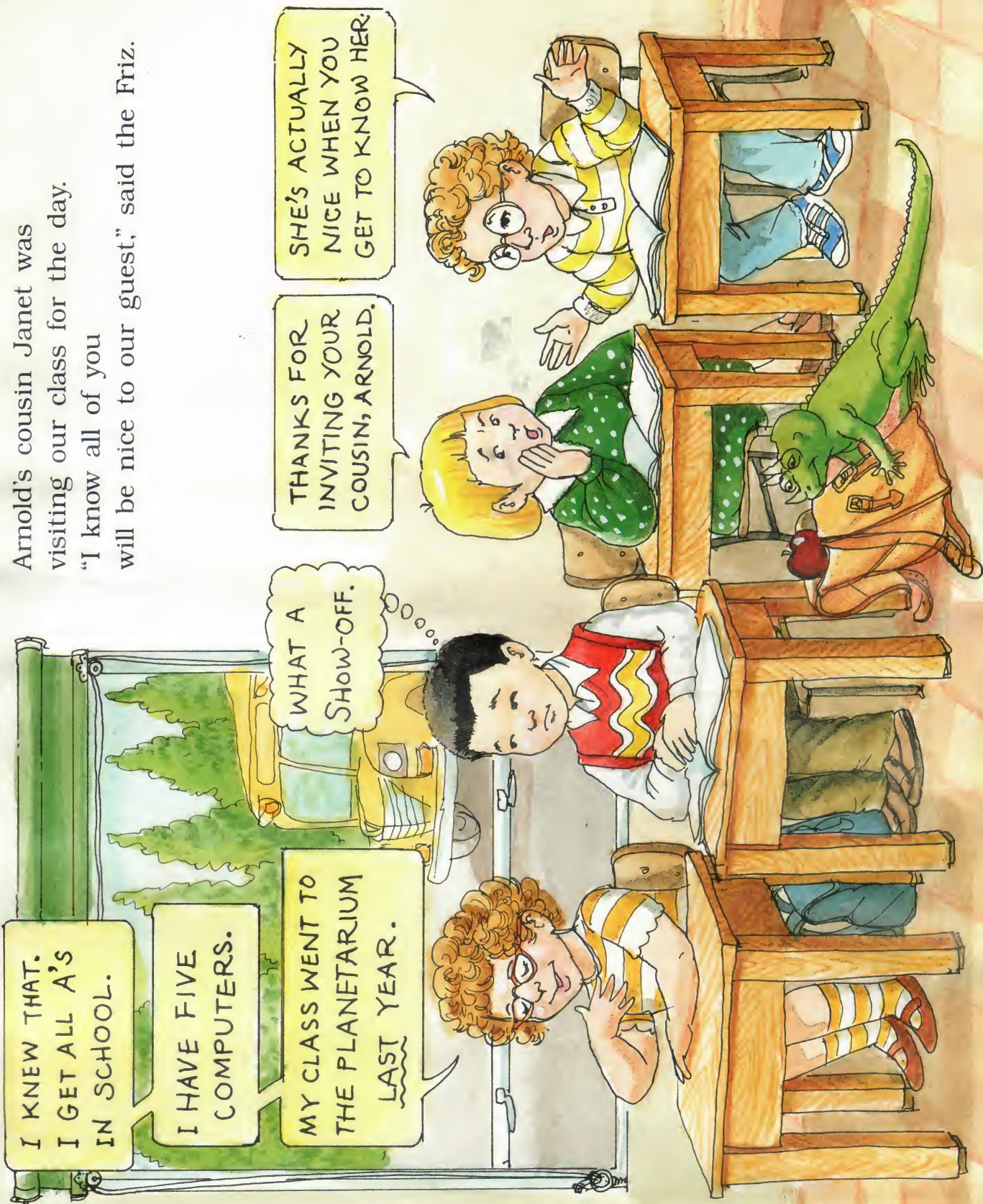
I HAVE FIVE
COMPUTERS.

MY CLASS WENT TO
THE PLANETARIUM
LAST YEAR.

WHAT A
SHOW-OFF.

THANKS FOR
INVITING YOUR
COUSIN, ARNOLD.

SHE'S ACTUALLY
NICE WHEN YOU
GET TO KNOW HER.



We tried to be nice to Janet.
We really did.

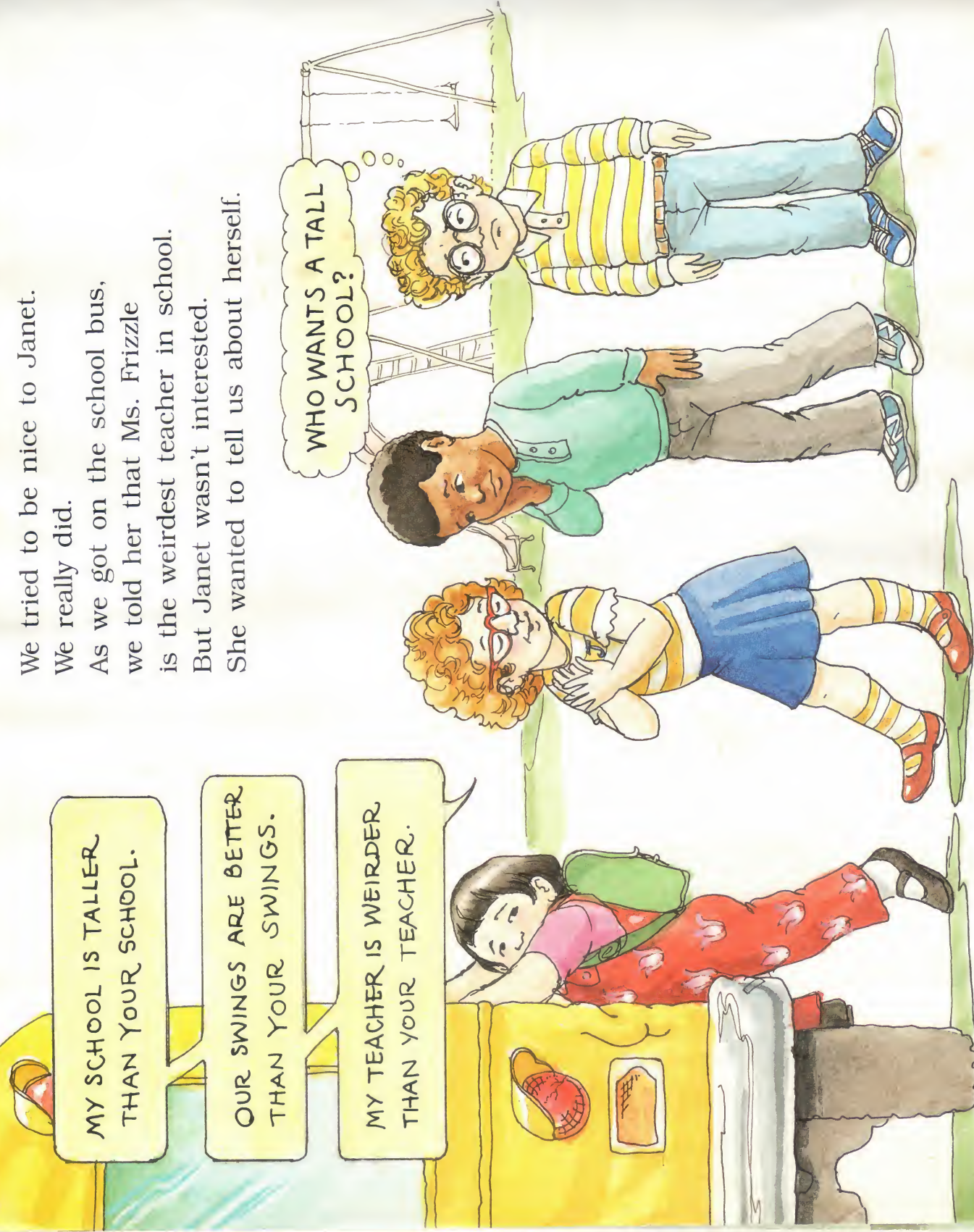
As we got on the school bus,
we told her that Ms. Frizzle
is the weirdest teacher in school.
But Janet wasn't interested.
She wanted to tell us about herself.

MY SCHOOL IS TALLER
THAN YOUR SCHOOL.

OUR SWINGS ARE BETTER
THAN YOUR SWINGS.

MY TEACHER IS WEIRDER
THAN YOUR TEACHER.

WHO WANTS A TALL
SCHOOL?



As usual, it took a while to get the old bus started.

But finally we were on our way.

As we were driving, Ms. Frizzle told us all about how the Earth spins like a top as it moves in its orbit. It was just a short drive to the planetarium, but Ms. Frizzle talked fast.

THIS BUS IS
A WRECK.

AT LEAST IT
STARTED THIS
TIME.

WE HAVE NEW
SCHOOL BUSES
AT OUR SCHOOL.

WHAT MAKES NIGHT
AND DAY?

by Phoebe

The spinning of the
Earth makes night and
day.

When one side of the
Earth faces the Sun
it is daytime on that side.
When that side turns
away from the Sun,
it is night.



WHEN THE EARTH SPINS
WE SAY IT ROTATES.
THE EARTH MAKES ONE
COMPLETE ROTATION—
TURN—EVERY 24 HOURS.

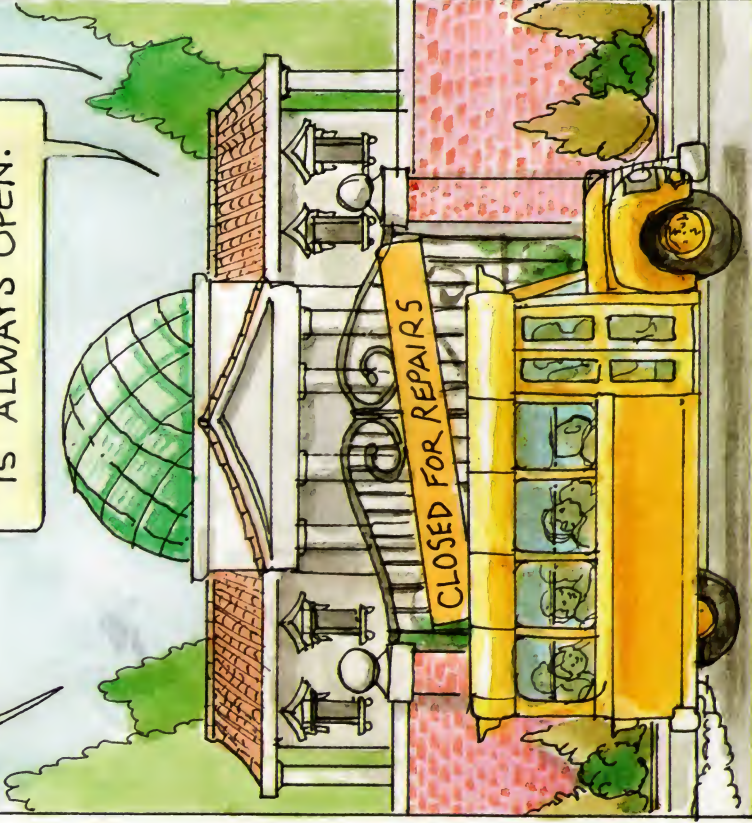


When we got to the planetarium,
it was closed for repairs.
“Class, this means we’ll
have to return to school,”
said the Friz.
We were so disappointed!

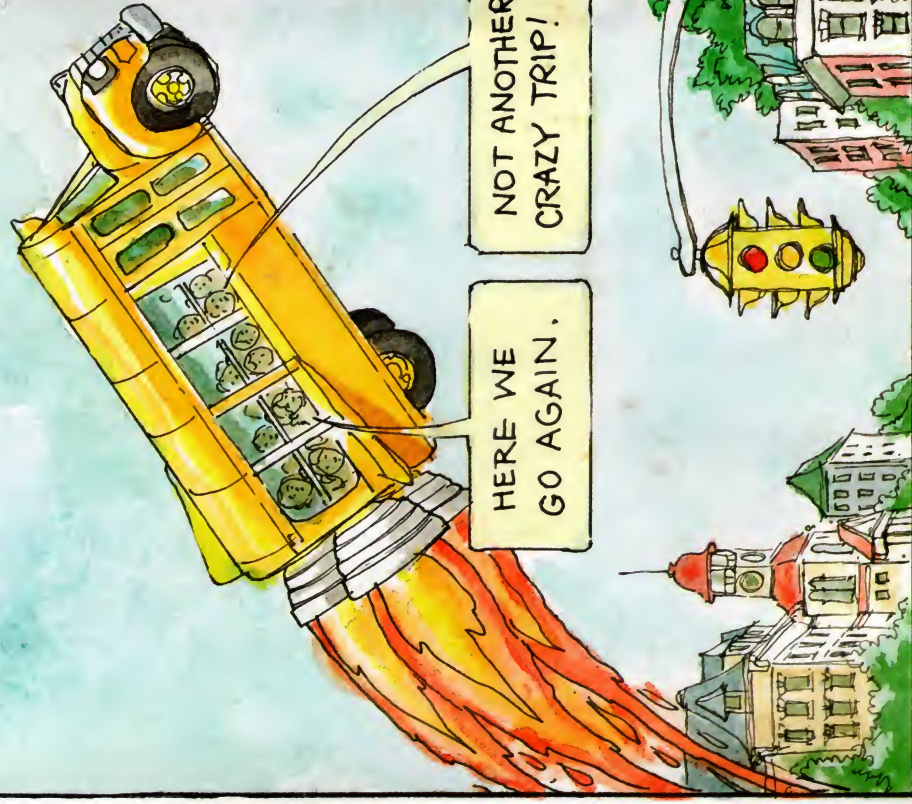
BACK TO SCHOOL?

I'M SO DEPRESSED!

MY PLANETARIUM
IS ALWAYS OPEN.



On the way back,
as we were waiting at a red light,
something amazing happened.
The bus started tilting back,
and we heard the roar of rockets.
“Oh, dear,” said Ms. Frizzle.
“We seem to be blasting off!”



HERE WE
GO AGAIN.

NOT ANOTHER
CRAZY TRIP!

CHILDREN, WE ARE GOING
THROUGH THE ATMOSPHERE
—THE LAYERS OF AIR
AROUND THE EARTH.



I GUESS WE'LL
BE SEEING THE
SOLAR SYSTEM
AFTER ALL.

MY BUS HAS
BIGGER ROCKETS
THAN YOUR BUS.

YEAH RIGHT, JANET.

WHY ARE SPACESHIPS LAUNCHED WITH ROCKETS?

by Wanda

- Spaceships cannot just fly into outer space. They need rockets to break free from the powerful grip of Earth's gravity.
-

WHAT IS GRAVITY?

by Michael

- Gravity is the force that pulls objects toward the center of the Earth.
- Other planets have gravity, too. Larger planets usually have more gravity. Smaller planets usually have less gravity.
-

WHY DO PEOPLE FEEL
WEIGHTLESS IN SPACE?

by Phil

Gravity gives objects weight. Without a large mass nearby — such as a planet — there is no gravity to pull objects down, so they do not have weight.

When the roar of the rockets stopped, we looked around. Everything had changed. The bus had turned into a spaceship. We were all dressed in space suits, and we were lighter than feathers. We floated above our seats!

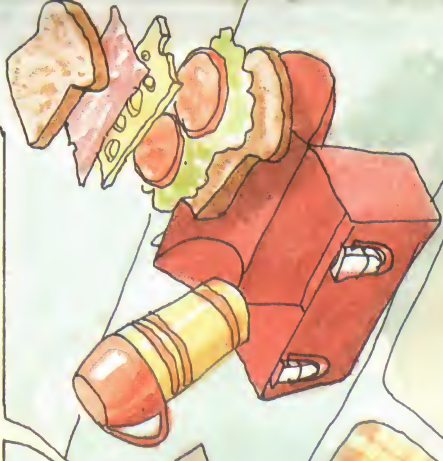
I'M FLYING!

I'M FLYING
HIGHER THAN
YOU ARE!

LOOK! IT'S
A U.F.B.

A WHAT?

AN UNIDENTIFIED
FLYING BANANA.

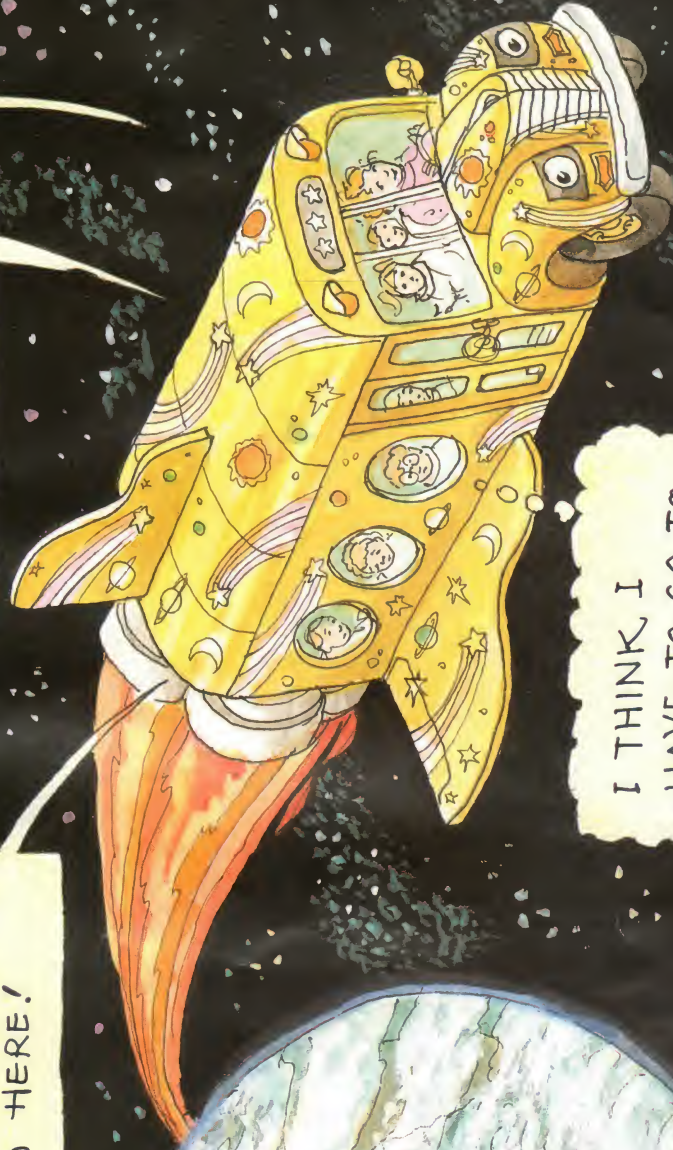


Far behind, in the black sky,
we saw the planet Earth
getting smaller and smaller.
We were traveling in space!
We had become astronauts!

LOOK HOW SMALL THE EARTH
SEEMS FROM HERE!

CLASS, NOTICE EARTH'S
BLUE OCEANS,
WHITE CLOUDS
AND BROWN LAND.

IT'S BEAUTIFUL!



I THINK I
HAVE TO GO TO
THE BATHROOM.

The Friz said our first stop would be the Moon. We got off the bus and looked around. There was no air, no water, no sign of life.

All we saw were dust and rock and lots of craters. Ms. Frizzle said the craters were formed billions of years ago when the Moon was hit by meteorites. Meteorites are falling chunks of rock and metal.

WE ARE SO LIGHT
ON THE MOON!

THAT'S BECAUSE
THE MOON HAS
LESS GRAVITY
THAN THE EARTH.

YOUR WEIGHT AND MASS
ON THE MOON

lbs.		lbs.
85	Earth Weight	14
		Moon Weight

You will travel
to far off
places.



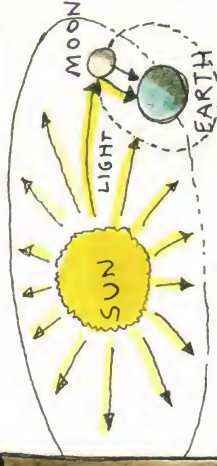
It was fun on the Moon.
We wanted to play,
but Ms. Frizzle said it was time to go.
So we got back on the bus.
"We'll start with the Sun,
the center of the solar system,"
said the Friz, and we blasted off.



WHAT MAKES THE MOON SHINE?

by Rachel

The Moon does not make any light of its own. The moonlight we see from Earth is really light from the sun. It hits the Moon and bounces off, the way light is reflected from a mirror.



THE MOON'S ORBIT

by Amanda Jane

The Moon travels in orbit around the Earth, just as the Earth travels around the Sun.

THE SUN IS A STAR

by Carmen

Our Sun is an average star like the ones we see in the night sky.

WHICH STAR DO WE SEE ONLY IN THE DAYTIME?

THAT'S EASY: THE SUN.



HOW BIG IS THE SUN?

by Gregory

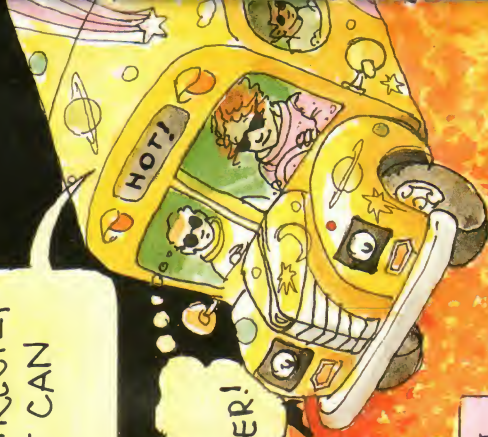
Our sun measures more than a million kilometers across. More than one million Earths could fit inside it!

We zoomed toward the Sun, the biggest, brightest, and hottest object in the solar system. Jets of super-hot gases shot out at us from the surface. Thank goodness Ms. Frizzle didn't get too close!

YOU SHOULD NEVER LOOK DIRECTLY AT THE SUN, CHILDREN. IT CAN DAMAGE YOUR EYES!

YOU SHOULD NEVER DRIVE A BUS DIRECTLY INTO THE SUN, EITHER!

SOLAR FLARES are giant storms on the Sun's surface.



She steered around to the other side and pulled away.

"We'll be seeing all the planets in order, class," explained Frizzzie.

"Mercury is the first planet, the closest to the Sun."

MY SCHOOL IS HEATED
WITH SOLAR ENERGY.

I HAVE A SUN DECK.

I HAVE TEN PAIRS
OF SUNGLASSES.

GIVE US A
BREAK, JANET.

SUNSPOTS
are dark spots
that are colder
than the rest
of the Sun.

HOW HOT IS THE SUN?

- by Florrie
- At the center of the sun the temperature is about 15 million degrees Centigrade! The sun is so hot it heats planets that are millions of kilometers away.

Our Path So Far



Mercury was a dead, sun-baked planet.
"This planet is a lot like our Moon.
There is no water and hardly any air,"
said the Friz.
"Notice the craters on its surface
as we pass by."

THE SUN LOOKS
TWICE AS BIG
HERE AS IT DOES
FROM EARTH.

THAT'S BECAUSE
MERCURY IS SO CLOSE.

TOO CLOSE!
LET'S GO!

YOUR WEIGHT AND EAT
ON MERCURY

lbs.

32

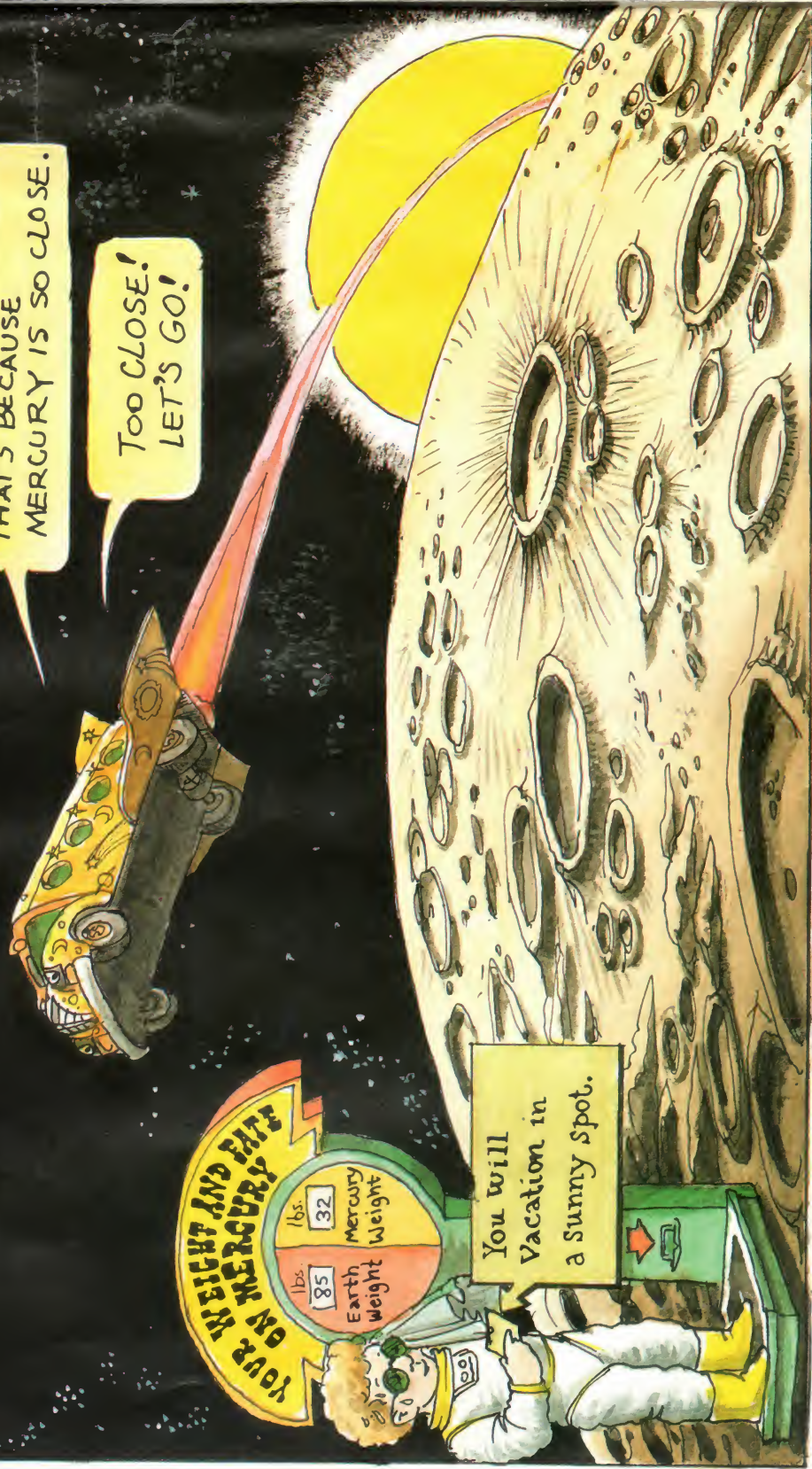
Mercury
Weight

lbs.

85

Earth
Weight

You will
Vacation in
a Sunny Spot.



Before long, we felt ourselves being pulled in by the gravity of Venus—the second planet from the Sun. Venus was completely covered by a thick layer of yellowish clouds. “We will now explore the surface of Venus,” said Ms. Frizzle.

WE’RE GAINING WEIGHT, AND WE HAVEN’T EVEN HAD LUNCH.

WE WILL BE HEAVIER HERE THAN ON THE MOON OR MERCURY BECAUSE VENUS HAS MORE GRAVITY.

WHY ARE VENUS’S CLOUDS YELLOW?

by Tim

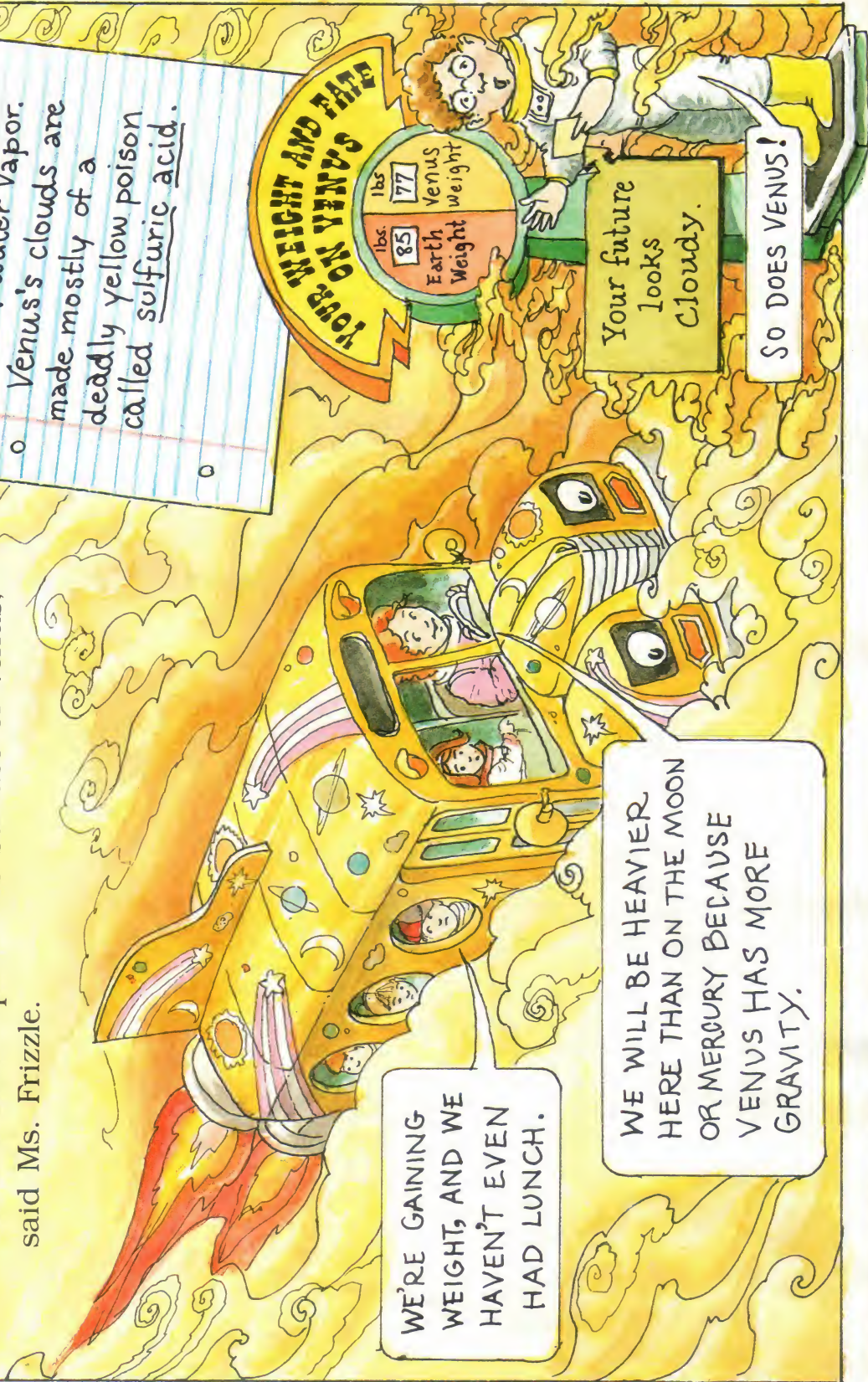
- Earth’s clouds are white because they are made of water vapor.
- Venus’s clouds are made mostly of a deadly yellow poison called sulfuric acid.

YOUR WEIGHT AND MASS

lbs.	77
Venus weight	
lbs.	85
Earth Weight	

Your future looks Cloudy.

SO DOES VENUS!



Below the clouds, Venus was as dry as a desert.

The ground was covered with rocks.

And it was HOT!

It was about 400 degrees Centigrade!

That's much hotter than an oven baking cookies!

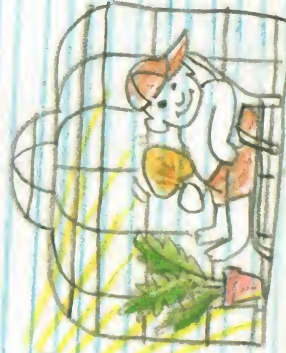
WHY IS IT SO HOT ON VENUS?

by Ralph

Venus's atmosphere has a lot of carbon dioxide gas in it. Carbon dioxide acts like a blanket to hold heat in.



When heat is trapped like this by a planet's atmosphere, it is called the "greenhouse effect."



THERE'S NO
LIFE ON VENUS,
CLASS.

IT'S TOO HOT!

IT'S TOO DRY!

THERE'S TOO MUCH ACID!

LET'S LEAVE!

The air was so heavy we could feel it pressing down on us! Ms. Frizzle said there might be volcanoes around, too.

We said, "Let's get out of here!"

"Our next stop is Mars, the red planet, fourth from the Sun," announced the Friz.

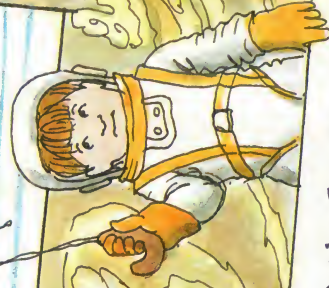
"On our way, we'll be passing through the orbit of Earth, the third planet."

The bus lifted off with a roar.

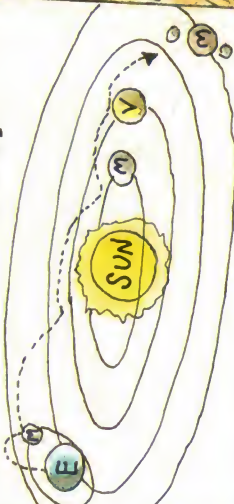
I'VE BEEN TO MARS
LOTS OF TIMES.

JUST
IGNORE HER.

IT NEVER RAINS
ON VENUS
by Dorothy Ann
Venus's clouds
never make rain
because it is too hot
for rain to form. Any
liquid on Venus dries
up instantly.



Our Path So Far



WHY AREN'T MARS'S MOONS ROUND?

by John

Large moons are round because of their gravity. Billions of years ago, when large moons formed, their gravity pulled in their material evenly and made them round.

The moons of Mars are so small that

they don't have enough gravity to be round.

THOSE ARE
MOONS?

THEY LOOK LIKE
POTATOES
WITH CRATERS.

As we came close to Mars,
we passed its two moons,
which are called Phobos and Deimos.
Compared to our Moon,
they were tiny.
And they weren't even round!

Phobos
(18 miles long)

Deimos
(9 miles long)

Volcano

LONG AGO, THERE
MAY HAVE BEEN
WATER IN THOSE
CHANNELS.

YES, BUT TODAY
ALL MARS'S WATER
IS FROZEN IN
THE POLAR
ICE CAPS.

Looking down, we saw a huge canyon.
Ms. Frizzle said it was
as long as the United States.
There was a volcano
three times taller than
the tallest volcano on Earth.
And all around, there were channels
that looked like dried-up river beds.

IS THERE LIFE ON MARS?

by Molly

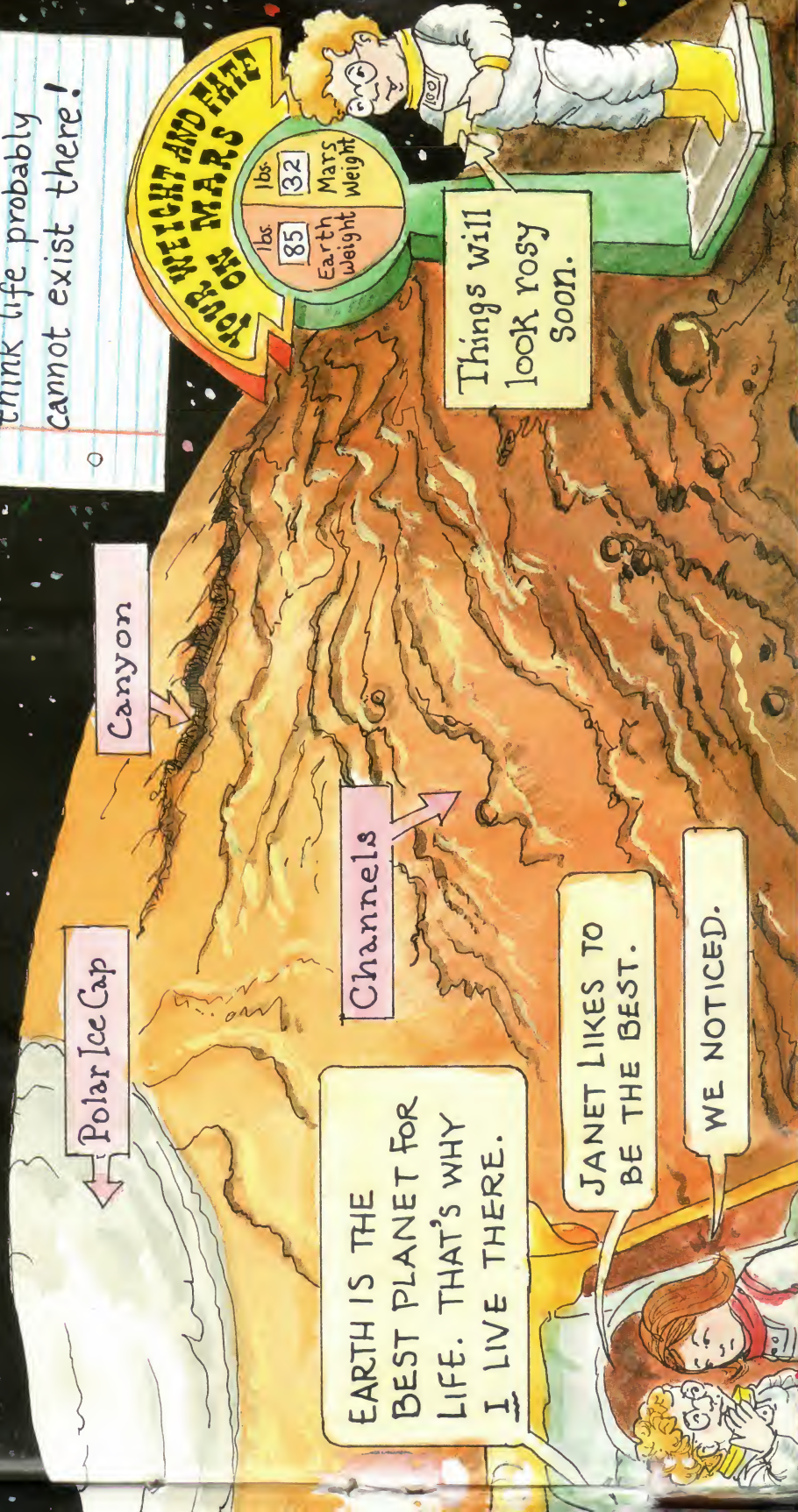
No life has been
found on Mars.

Living things need

water, and there

is no liquid water
on Mars.

So space scientists
think life probably
cannot exist there!



WHY IS MARS RED?

by Arnold

Mars looks red because there is a lot of rusty iron in its soil.

The sky looks pinkish because of red dust in the air.

We landed and started walking around. Suddenly a huge dust storm blew up. Ms. Frizzle said dust storms on Mars can last for months.

They may cover the whole planet. We scrambled back on the bus and headed out!

ARE THERE ANY ALIENS HERE?

I DON'T SEE ANY.

DON'T BE TOO SURE.



"Mars is the last of what we call the inner planets!"

Ms. Frizzle shouted above the roar of the rockets. "We will now be going through the asteroid belt to the outer planets!"

ISN'T SPACE TRAVEL EXCITING, ARNOLD?

I REALLY PREFER FILMSTRIPS.

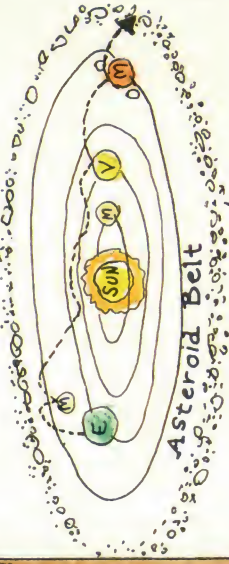
AIR LOCK
KEEP THIS
DOOR CLOSED

WHAT ARE THE INNER PLANETS?

by Alex

The inner planets are the four planets closest to the Sun—Mercury, Venus, Earth and Mars. The four inner planets are all hard and rocky.

Our Path So Far



THE ASTEROID BELT

by Shirley

The area between the inner and the outer planets is called the asteroid belt. It is filled with thousands and thousands of asteroids.

WHAT ARE ASTEROIDS?

by Florrie

Asteroids are chunks of rock and metal in orbit around the Sun.

- Scientists think they are the building blocks of a planet that never formed.

Thousands of asteroids were spinning all around us.

All at once, we heard the tinkling of broken glass.

One of our taillights had been hit by an asteroid.

Ms. Frizzle put the bus on autopilot and went out to take a look.

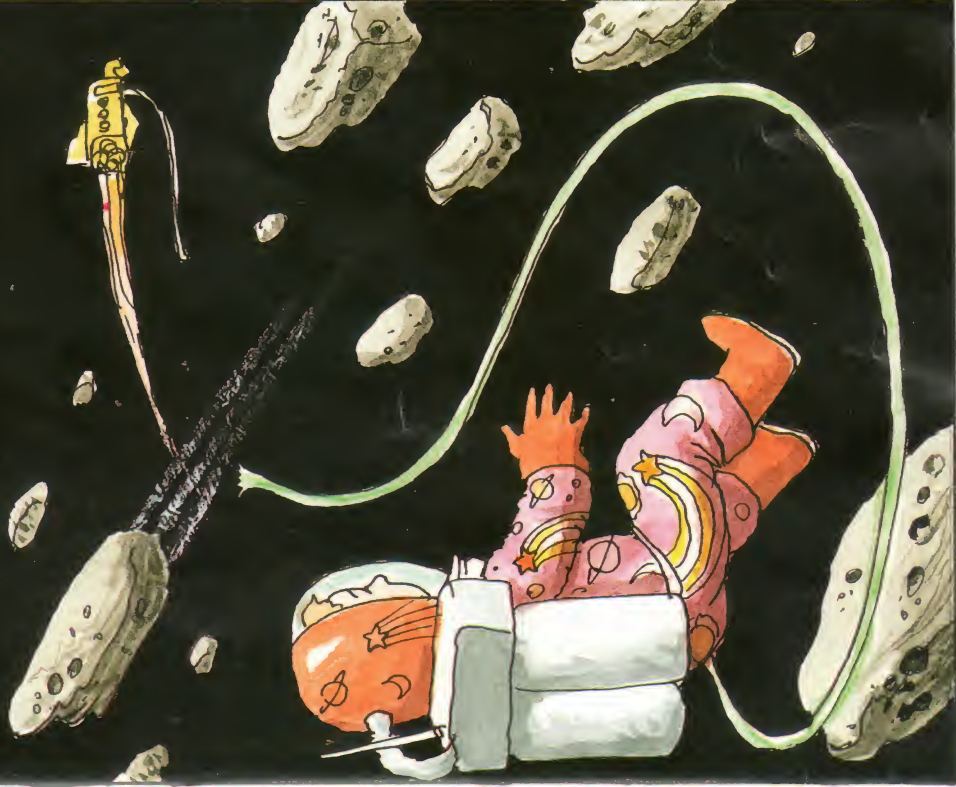
She kept on talking about asteroids over the bus radio.

THE LARGEST ASTEROID IS ONLY $\frac{1}{3}$ THE SIZE OF OUR MOON. MOST ASTEROIDS ARE THE SIZE OF HOUSES OR SMALLER.

I WISH SHE'D COME INSIDE.



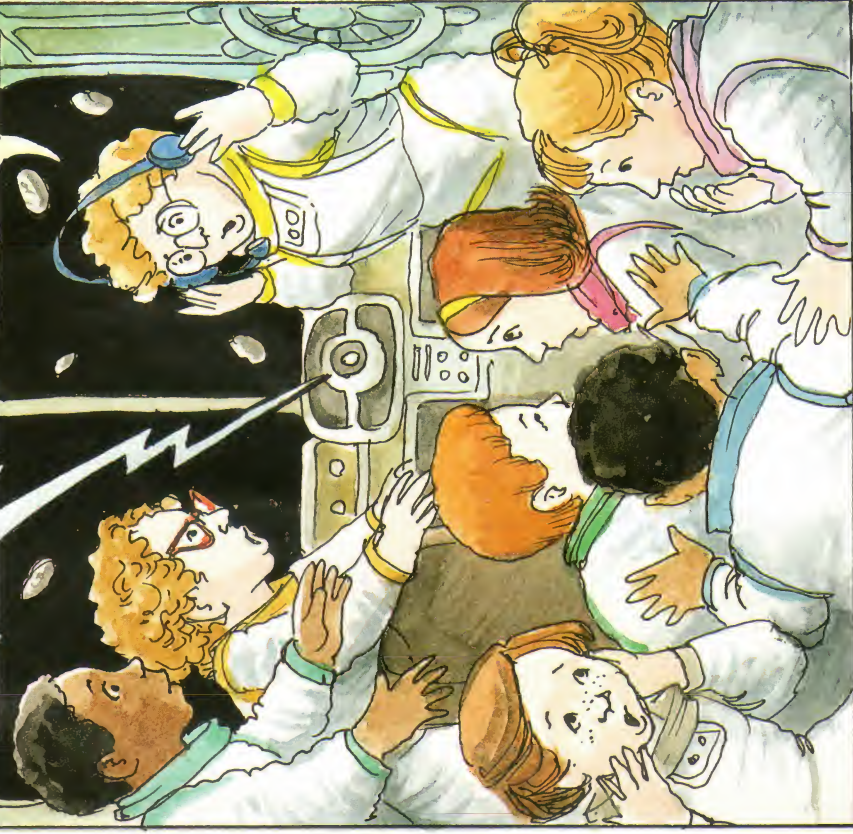
Suddenly there was a snap.
Ms. Frizzle's tether line had broken!
Without warning,
the rockets fired up,
and the bus zoomed away!
The autopilot was malfunctioning.



On the radio, Ms. Frizzle's voice grew
fainter and fainter.
Then she was gone.
We were on our own!
We were lost in the solar system!

KIDS, I'LL MEET YOU
LATER... LATER... LATER.

COME IN,
MS. FRIZZLE.
DO YOU READ ME?



Most of us were too scared to move. But Janet started searching the bus. In the glove compartment she found Ms. Frizzle's lesson book. As she began reading from it, a huge planet came into view. "Class, this is Jupiter," Janet read. "It's the first of the outer planets, and the largest planet in the solar system."

SHE SHOULDN'T TOUCH
MS. FRIZZLE'S THINGS.

BUT THIS IS AN
EMERGENCY!

"As we approach
Jupiter, we can
see some of its
16 moons."

"Arnold, are you listening?"

BOY, MS. FRIZZLE
PLANS EVERYTHING!



We thought the school bus was going to land.

But there was no solid ground to land on.

Jupiter is a "gas giant" —

a planet made almost entirely of gas.

As we left Jupiter,

we wondered and worried.

Would we ever get home?

Great Red Spot

"Jupiter is so big that more than one thousand Earths could fit inside it."

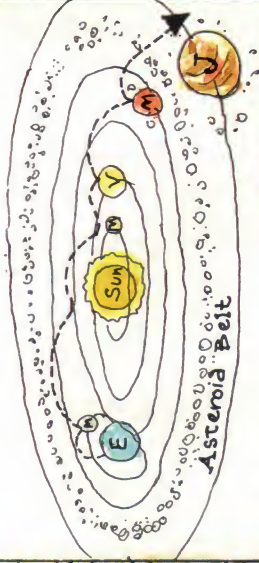
MS. FRIZZLE, WHERE ARE YOU?

WHAT IS JUPITER'S GREAT RED SPOT?

by Gregory

The Red Spot is probably a huge storm of swirling gas that has lasted for hundreds and hundreds of years.

Our Path (Continued)

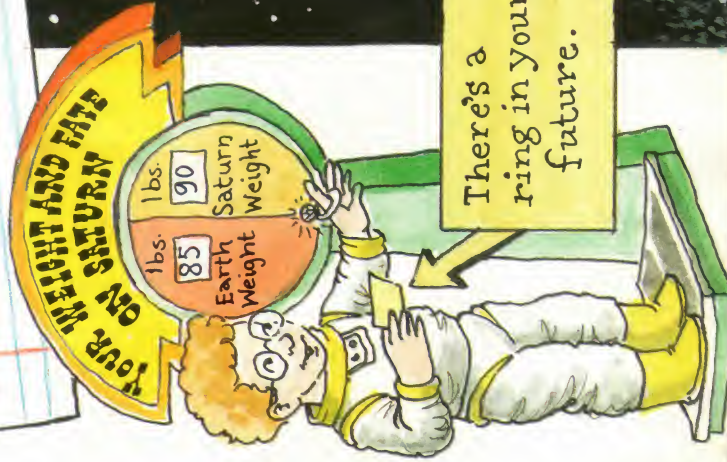


WHAT ARE SATURN'S RINGS?

by Rachel

Saturn's rings are made of ice, rock and dust—all in orbit around the planet.

The next sight made us forget our troubles. It was Saturn, a gas planet like Jupiter. It had swirling clouds and lots of moons. But the most incredible thing about Saturn was its rings. It was the most beautiful planet in the solar system!



"There are thousands of rings around Saturn, class."

THEY LOOK LIKE THE GROOVES IN A PHONOGRAPH RECORD.

SATURN IS THE GROOVIEST PLANET, MAN!

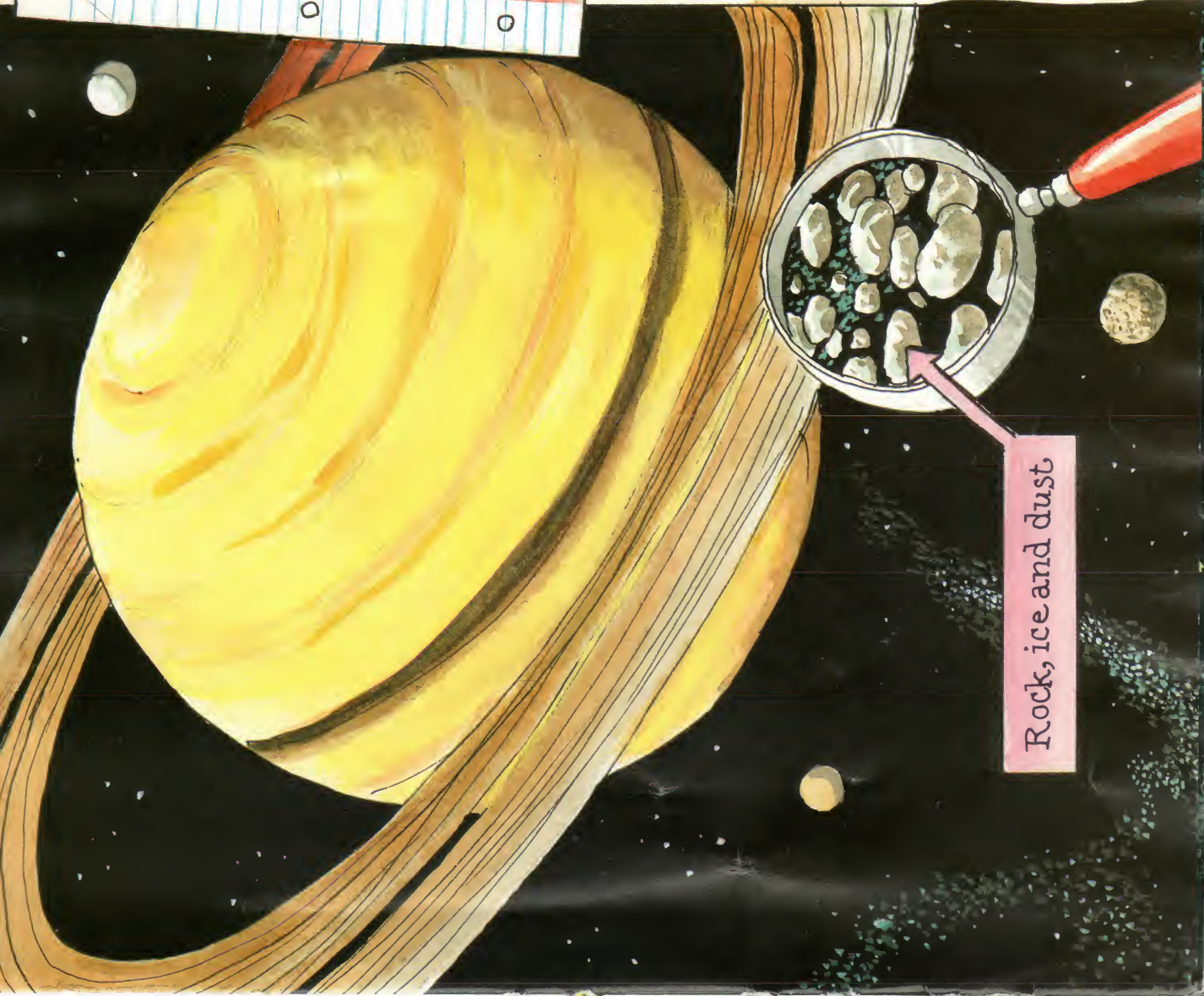


THE FLOATING PLANET

by Phoebe

Saturn is made of materials that are lighter than water.

If there were a bathtub big enough, Saturn could float in it!



COULD SATURN
TAKE A BATH?

YES, BUT IT
MIGHT LEAVE
A RING!



THE TIPPED OVER PLANET

by Ralph

Uranus spins differently from the other planets.
It seems to be lying on its side compared to most other planets in the Solar System.

Next was Uranus, a blue-green gas planet with faint gray rings and moons. Some scientists think they might be made of chunks of graphite—the material used in pencils on Earth.

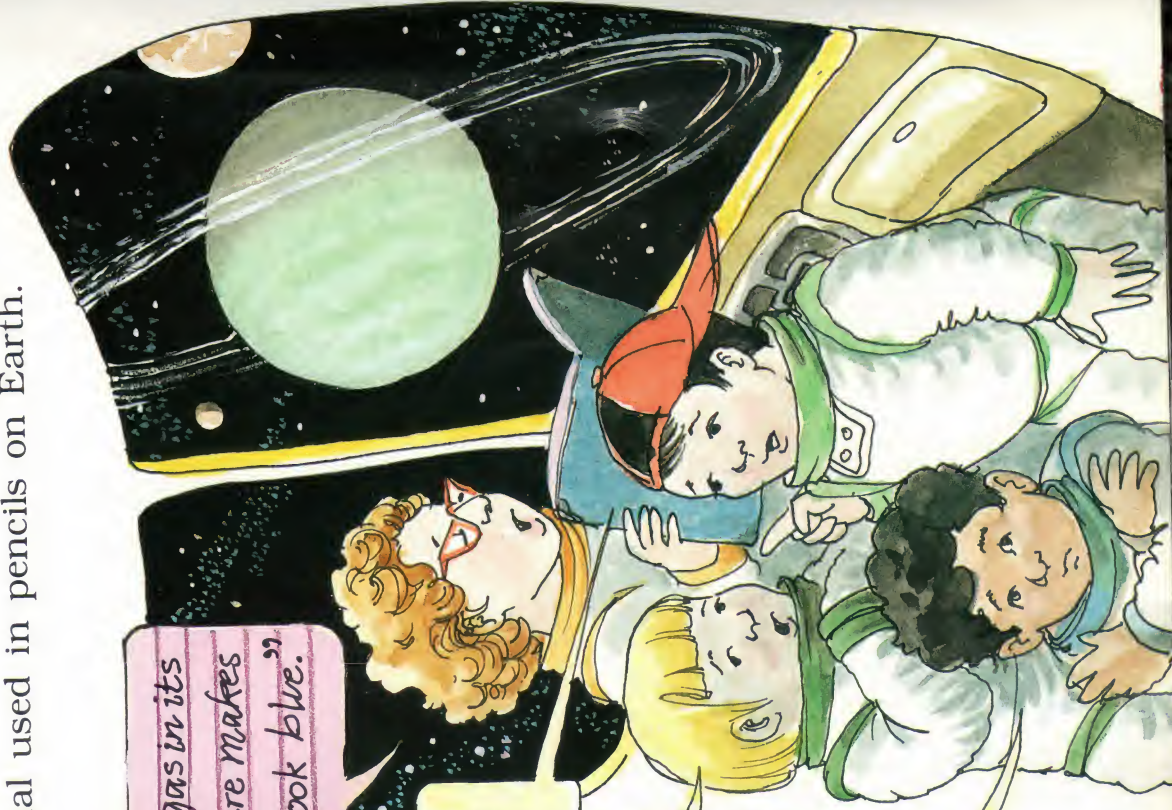
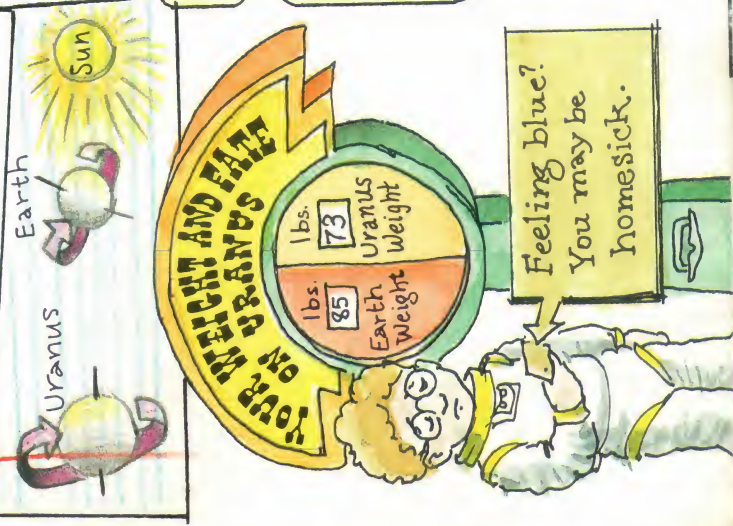
"Methane gas in its atmosphere makes Uranus look blue."

YOU LOOK
KIND OF BLUE
YOURSELF.

I'M FREEZING!

THAT'S BECAUSE
WE'RE SO FAR
AWAY FROM
THE SUN.

Feeling blue?
You may be
homesick.



The bus was going faster and faster, and we couldn't control the autopilot. We swept past stormy Neptune, another blue-green planet—eighth from the Sun. All we could think about was finding Ms. Frizzle!

"Neptune is the fastest of the giant gas planets."

WE'RE ALMOST OUT OF GAS OURSELVES!

Great Dark Spot

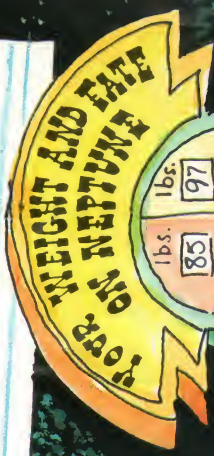
AND THE NEAREST SERVICE STATION IS 4,000 MILLION KILOMETERS AWAY.

How LONG IS A YEAR?
by Tim

A year is the time it takes for a planet to go all around the sun. Neptune and Uranus are so far away from the sun that they have very long years.

One year on Uranus is 84 Earth years.

Neptune's year is 165 Earth years.



You will have a happy birthday 165 years from now!



IS PLUTO A REAL PLANET?

by Wanda

Some scientists think Pluto was once a moon of Neptune. It may have escaped from the orbit around Neptune. Then it became a real planet in orbit around the Sun. Pluto was the last planet discovered in the known Solar system.

We were going so fast, we almost missed seeing the ninth planet, tiny Pluto,* and its moon, Charon. We were so far away from the Sun that it didn't look big anymore. It just looked like a very bright star. We were leaving the solar system.

**Every 248 years, Neptune's orbit is further out than Pluto's. Then Neptune is the ninth planet. But most of the time, Pluto is the ninth planet from the Sun.*

THERE'S NOTHING
OUT THERE —
BUT STARS.

MAYBE THERE'S
A TENTH PLANET
WAITING TO BE
DISCOVERED.

IT'LL HAVE
TO WAIT.

I HOPE
MS. FRIZZLE
IS WAITING, TOO.

YOUR WEIGHT AND AGE
ON PLUTO

lbs.

85

Earth
Weight

lbs.

1 1/2

Pluto
Weight

You will meet
a small, dark
planet.

CHARON

PLUTO



Janet flipped rapidly through Ms. Frizzle's book. Suddenly she found something new—the instructions for the autopilot. We punched in ASTEROID BELT on the control panel. Slowly the bus turned around. It was working! We were going back!



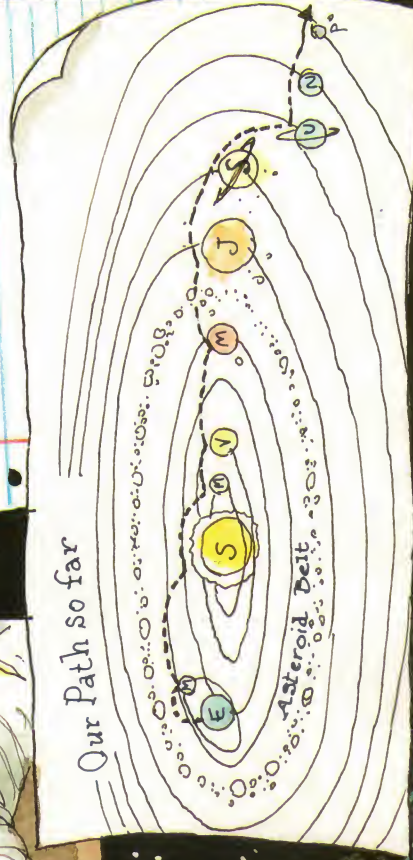
JANET REALLY
SAVED THE DAY.

I TOLD YOU
SHE'S A GOOD
KID.

BEYOND PLUTO: STARS AND MORE STARS by Alex

- Beyond our solar system are billions and billions of stars. There are so many stars and they are so far away that our minds cannot even imagine it. Some of those stars may have planets, and some of those planets could have life on them, just like our earth.

Our Path so far



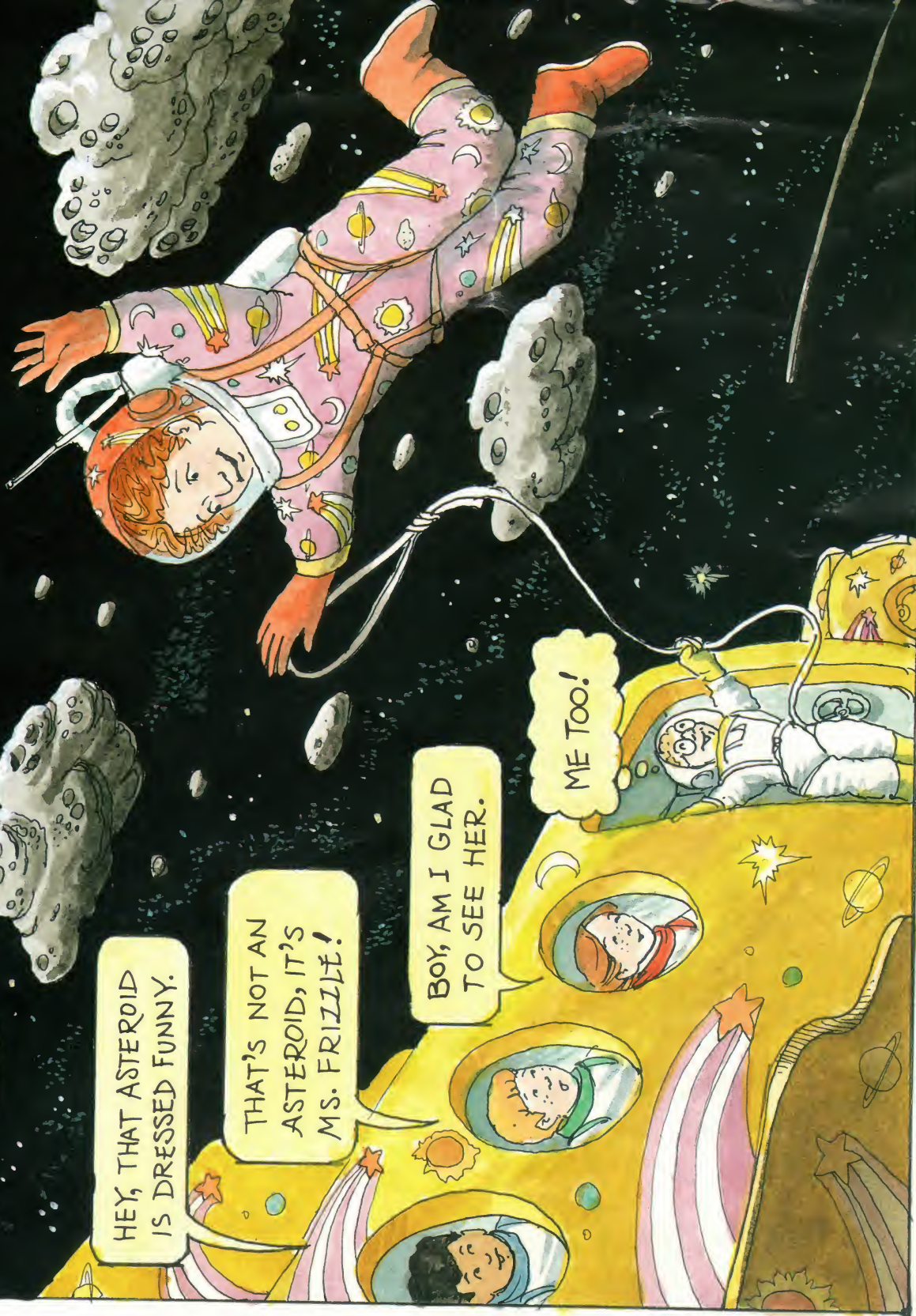
When we reached the asteroid belt,
there was Ms. Frizzle!

HEY, THAT ASTEROID
IS DRESSED FUNNY.

THAT'S NOT AN
ASTEROID, IT'S
MS. FRIZZLE!

BOY, AM I GLAD
TO SEE HER.

ME TOO!



With Frizzie back at the wheel,
the bus headed straight for Earth.
We reentered the atmosphere,
landed with a thump,
and looked around.

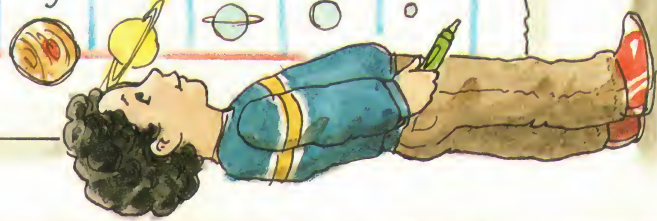


We were in the school parking lot again.
The rockets were gone.
The space suits were gone.
The bus was a wreck.
Everything was back to normal.

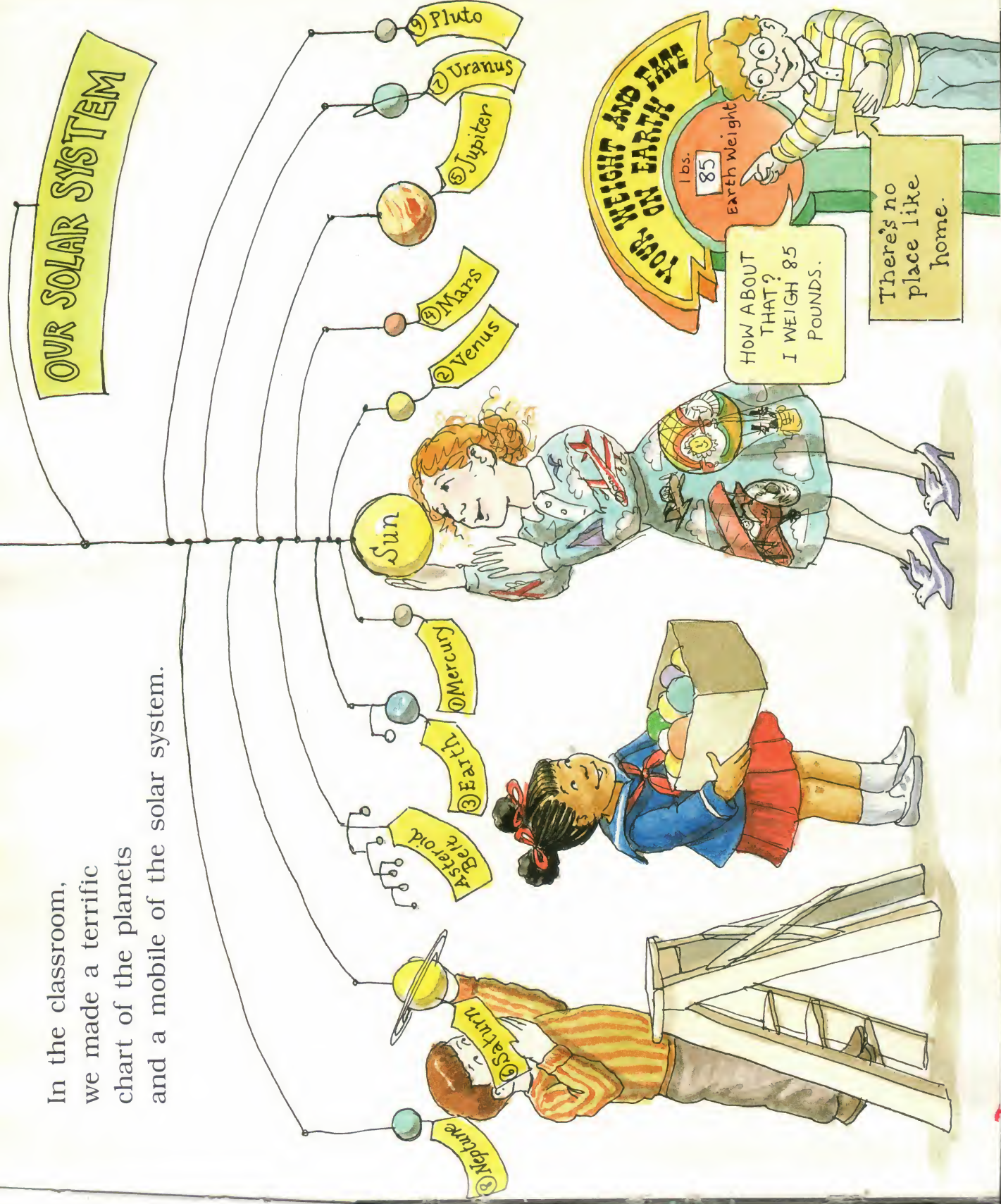


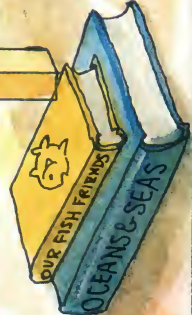
OUR PLANET CHART

PLANET	HOW BIG ACROSS	HOW LONG ONE ROTATION (DAY AND NIGHT)	HOW LONG ONE YEAR	HOW FAR FROM THE SUN	HOW MANY MOONS	HOW MANY RINGS
MERCURY	4,900 km.	59 days	88 days	57.9 million km.	None	None
VENUS	12,100 km.	243 days	224.7 days	108.2 million km.	None	None
EARTH	12,756 km.	24 hours	365.3 days	149.6 million km.	1	None
MARS	6,800 km.	24.5 hours	687 days	227.8 million km.	2	None
JUPITER	142,800 km.	9.8 hours	12 Earth years	778 million km.	at least 16	2
SATURN	120,660 km.	10.7 hours	29.5 Earth years	1,427 million km.	at least 17	Many
URANUS	52,400 km.	17 hours	84 Earth years	2,870 million km.	at least 15	10
NEPTUNE	49,500 km.	16 hours	165 Earth years	4,500 million km.	8	4
PLUTO	about 2,300 km.	6 days	248 Earth years	5,900 million km.	1	None



OUR SOLAR SYSTEM







ATTENTION, READERS!

DO NOT ATTEMPT THIS TRIP ON YOUR OWN SCHOOL BUS!

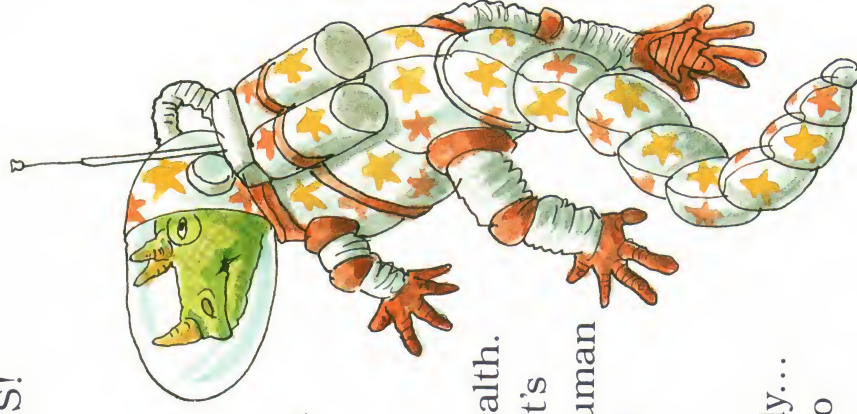
Three reasons why not:

1. Attaching rockets to your school bus will upset your teacher, the school principal, and your parents. It will not get you into orbit anyway. An ordinary bus cannot travel in outer space, and you cannot become astronauts without years of training.
2. Landing on certain planets may be dangerous to your health. Even astronauts cannot visit Venus (it's too hot), Mercury (it's too close to the Sun), or Jupiter (its gravity would crush human beings). People cannot fly to the Sun, either. Its gravity and heat would be too strong.

3. Space travel could make you miss dinner with your family... for the rest of your childhood. Even if a school bus could go to outer space, it could never travel through the entire solar system in one day. It took years for the Voyager space probes to do that.

ON THE OTHER HAND...

If a red-haired teacher in a funny dress shows up at your school — start packing!







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